

PREFACE

In this book the authors seek to present the state-of-the-art theory concerning the various aspects of the activated sludge system and to develop procedures for optimized cost based design- and operation. The book has been written for students at MSc or PhD level, as well as for engineers in consulting firms and environmental protection bodies.

Since its conception almost a century ago, the activated sludge system has played an important role in the area of waste water treatment. This was originally due to its high efficiency at removing suspended solids and organic material, which at that time was the most important treatment objective. The earliest design principles for activated sludge systems date back to the second half of the 20th century, almost 50 years after the first systems were constructed, and many further developments have occurred since. As nitrogen is one of the key components in eutrophication of surface water, in the 1970s nitrogen removal became a requirement and this resulted in the incorporation of nitrification- and denitrification processes in the activated sludge system. An important subsequent development was the introduction of chemical- and biological phosphorus removal in the 1980s and 1990s. Over the last decades the predominance of the activated sludge system has been consolidated, as cost-efficient and reliable biological removal of suspended solids, organic material and the macro-nutrients nitrogen and phosphorus has consistently been demonstrated. This versatility is also shown in the continuous development of new configurations and treatment concepts, such as anaerobic pre-treatment, membrane bioreactors, granular aerobic sludge and ammonium oxidation over nitrite. It is therefore scarcely surprising that many books have been dedicated to the subject of waste water treatment and more specifically to one or more aspects of the activated sludge system.

So why should you consider buying this book? The two main reasons why this book is an invaluable resource for everybody working in the field of waste water treatment are the following:

1. The scope of this book is extremely broad and deep, as not only the design of the activated sludge system, but also that of auxiliary units such as primary and final settlers, pre-treatment units, sludge thickeners and digesters is extensively discussed;
2. The book offers a truly integrated design method, which can be easily implemented in spreadsheets and thus may be adapted to the particular needs of the user.

In this text, the theory required to describe the different processes taking place in activated sludge systems is presented. It is demonstrated that the sludge age is the main design parameter for both aerobic and anaerobic systems. A simplified steady-state model is developed that will prove extremely useful for the design and optimisation of activated sludge systems. This model describes the removal of organic material in the activated sludge system and its consequences for the principal parameters determining process performance: effluent quality, excess sludge production and oxygen consumption. The design guidelines for biological or chemical nutrient removal are integrated with those of other main treatment units, such as the final settler, pre-treatment units, thickeners and digesters. Finally, the text will also deal with operational issues: e.g. sludge settling and -bulking, oxygen transfer, maintenance of an adequate pH, sludge digestion and methane production.

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